

A SYNOPSIS OF MICROWAVE REMOTE SENSING INVESTIGATIONS PLANNED FOR BOREAS

Kyle C. McDonald

Mail Stop 300-233

Jet Propulsion Laboratory

California Institute of Technology

4800 Oak Grove Drive

Pasadena, CA 91109, U.S.A.

Phone: (818) 354-3263, FAX: (818) 354-9476

email: mcdonald@black.jpl.nasa.gov

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ABSTRACT

The Boreal Ecosystem - Atmosphere Study (BOREAS) is a multidisciplinary field and remote sensing study that will be implemented jointly by the United States and Canada. The goal of BOREAS is to obtain an improved understanding of the interactions between the boreal forest biome and the atmosphere in order to clarify their roles in global change. Specific objectives are to improve the understanding of the processes that govern the exchanges of water, energy, heat, carbon and trace gases between boreal ecosystems and the atmosphere and to develop and validate remote sensing algorithms for transferring the understanding of these processes from local to regional scales. Two principle field sites, both within Canada, have been selected for this study. The northern site is located near Thompson, Manitoba and the southern site encompasses Jasper National Park in Saskatchewan. Most of the fieldwork will occur at these two sites during 1993 and 1994 as part of six field campaigns.

This paper presents an overview of the microwave remote sensing activities that have been selected to be part of BOREAS. A brief summary of the overall BOREAS activity is provided together with a discussion of the microwave studies and their contribution to the overall objectives of BOREAS. Of these five selected investigations, four are radar studies and one is a passive microwave investigation. Goals of the radar studies include: (1) estimation of the distribution and structure of biomass within the ecosystem, (2) estimation of hydrological parameters of the boreal forest, (3) determination of and monitoring the duration of environmental and phenologic state of various functional groups within the biome in order to provide new input to CO₂ flux models and (4) coupling SAR imagery to ground measurements via scatterometer observations. Finally, the passive microwave study investigates the seasonal and diurnal radiobrightness signature of the boreal forest.

These studies have been designed to investigate both the static and temporally varying microwave signatures of this biome. Multi-frequency polarimetric SAR imagery will be collected by an aircraft-borne system during the field campaigns. This will allow detailed analysis of the static and temporally varying aspects of backscatter. During the intervals between these campaigns, imagery from the ERS-1 satellite will provide more of a continuous monitoring capability. Specific goals and objectives of these studies are discussed together with the methodology that the investigators have proposed for achieving their objectives.